BZ560-1-F

WORLD ENERGY OUTLOOK THROUGH 2000

conoco
April 1985

Introduction

World oil and natural gas demand both declined for several years following the energy price shock that accompanied the Iranian Revolution. Excess production capacity developed, leading to heightened competition between energy producers and, eventually, a partial reversal of the price run-up. Now, in response to lower energy prices and reinvigorated economic growth, demand for all forms of energy is growing steadily. Simultaneously, lower prices have reduced the incentive to explore for and develop additional secure energy supplies. As a result, **dependence on energy supplies from areas where there is a potential for interruptions will increase substantially in the years ahead.** As shown in EXHIBIT 1, OPEC will supply more than half of the world's oil in the year 2000, up from about two-fifths in 1984. Reliance on natural gas from the Soviet Union and OPEC also will increase significantly. Over the remainder of the century, the non-Communist world will rely on OPEC and Communist nations for fully one-fourth of its energy.

Rising dependence on potentially insecure energy supplies means increased vulnerability to energy supply interruptions and accompanying disruptions of economic activity. **If the market forces that encourage rising dependence on insecure energy supplies are to be circumvented, governments must adjust their policies to stimulate development of more reliable supplies.** Unfortunately, complacency regarding energy security has increased as oil prices have decreased. In addition, the issue of energy security has been overshadowed in the United States by efforts to reduce the federal budget deficit and reform the tax system. **Energy security must not become a casualty of the pursuit of other national priorities.**

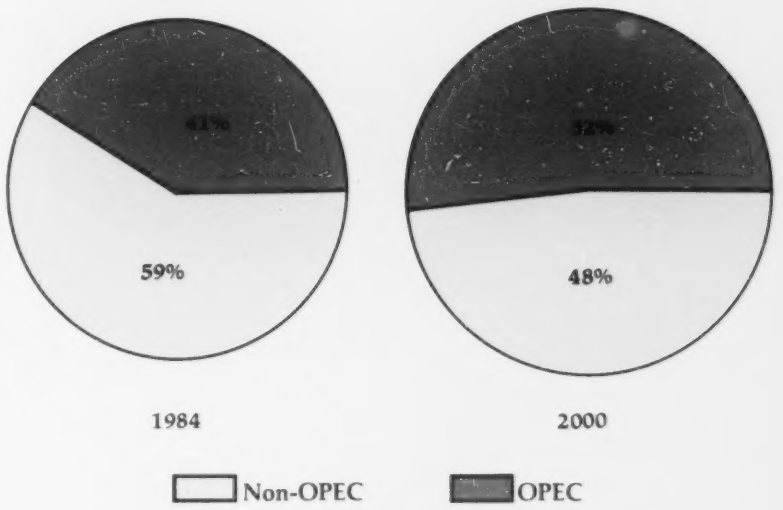
Key Factors

This outlook is predicated upon the following developments in the key factors that shape energy markets:

Oil prices. Excess production capacity within OPEC and competition from non-OPEC producers will maintain downward pressure on world crude prices through the late 1980s. EXHIBIT 2 depicts the recent history of nominal-dollar crude prices and a range of likely future price scenarios. The range does not cover such possibilities as a major disruption of Middle Eastern oil supplies or a complete breakup of OPEC. **This outlook is based upon a most likely price scenario** within the range **in which crude prices erode gradually in the near term, then level out and increase somewhat faster than inflation in the 1990s** as excess OPEC production capacity is reduced.

EXHIBIT 1

Sources of World Oil Supply



Economic growth. **Non-Communist world economic growth will average just over 3 percent per year during the remainder of the 1980s before slowing somewhat in the 1990s.** The U.S. economy will perform near the world average on the basis of strong productivity growth. The economies of Japan and the developing world will expand more rapidly due to stronger productivity growth and continuing rapid population growth, respectively. The economies of Western Europe and the other developed nations will lag behind the rest of the non-Communist world due to labor market rigidities and high government involvement in economic affairs.

Oil supplies. **This outlook assumes that there will be no major, sustained disruption of oil supplies,** although the possibility does exist. It also assumes that the governments of non-OPEC countries make no significant changes in their policies affecting oil production.

Natural gas prices. **Natural gas is expected to maintain price competitiveness with oil products in end-use markets.** Thus, gas prices should be weak in the near term and grow moderately in real terms in the longer run.

Coal prices. **Coal will maintain its price advantage over oil and gas as fuel for new electric utility boilers. But for new, smaller industrial boilers and conversion of boilers currently fueled by oil or gas, coal's price advantage is expected to be largely eliminated** by (1) weak near-term oil and gas prices and (2) the increased costs of burning coal associated with stricter environmental regulations. Increases in coal prices will be constrained by the ample coal reserves that can be economically developed at today's prices. Nonetheless, some increases in coal prices are likely in the 1990s as coal demand continues to expand.

Economics of nuclear power. Due to rapidly escalating plant construction costs and less-than-optimal reactor performance, coal will be preferred to nuclear power as fuel for new baseload electric power plants in most of the United States. In other countries, nuclear power will generally continue to enjoy a modest though narrowing cost advantage.

EXHIBIT 2

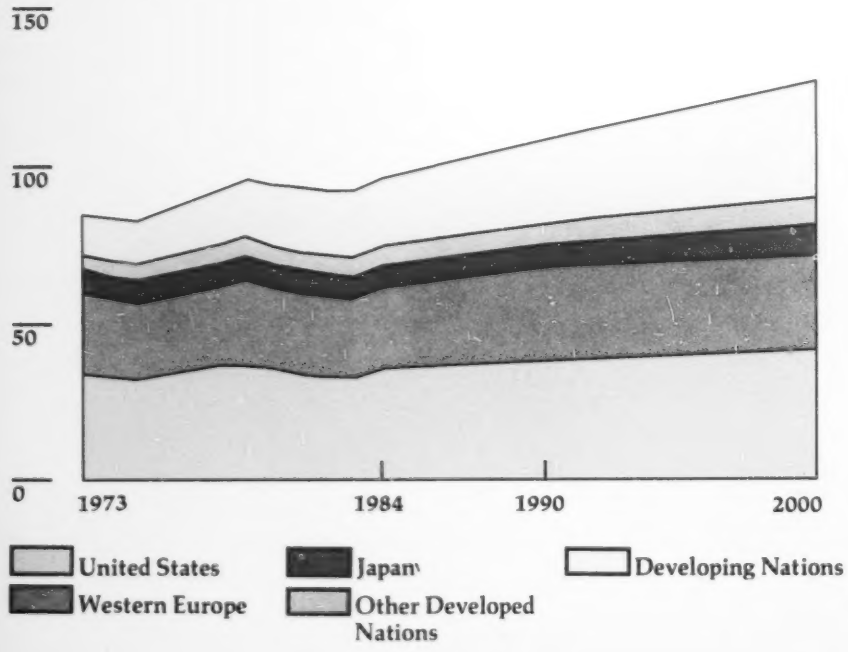
Crude Oil Price History and Forecast

(Dollars Per Barrel)

EXHIBIT 3

World Energy Demand

(Million Barrels Per Day Oil Equivalent)



Economics of renewables. Renewable energy sources such as biomass, wind power, and solar power will not be cost effective given the price outlook for conventional energy supplies, except on a small scale in unique local cases.

Note: Throughout this outlook, the "world" is defined as the non-Communist world. Only the net energy trade of the Communist Bloc is counted in world energy supply-demand balances. The developed world refers to member countries of the Organization for Economic Cooperation and Development (OECD). The developing world, sometimes called the Third World, refers to the remaining non-Communist nations.

World Energy Demand

World energy demand will grow 2 percent per year over the rest of the 1980s and about 1½ percent annually thereafter. The developing world will account for half of the total increase. Energy demand growth in the developed world will be slower due to generally less rapid economic growth and greater declines in energy use per unit of economic activity.

World energy demand is expected to grow from 90 million barrels per day of oil equivalent (MMBDOE) in 1984 to 108 MMBDOE in 1990 and 128 MMBDOE in 2000. As illustrated in EXHIBIT 3, much of the growth will come from the developing world where per-capita energy use is currently one-tenth that of the developed world. Electrification, which is especially energy-intensive, is receiving primary attention in many developing countries. Rising Third World incomes will also increase the number of people who can afford energy-consuming capital goods such as cars and appliances. In the developed world, on the other hand, saturation is approaching for many of these same energy-consuming items.

Higher growth in energy demand in the developing world is a result of both above-average economic growth and a

slower decline in energy use per unit of economic activity. As demonstrated in EXHIBIT 4, some areas of the developed world such as the United States currently have higher energy demand per unit of economic activity than the Third World as a whole. But all developed regions of the world will experience more pronounced declines in the energy intensity of their economic activity due to (1) the ongoing migration of energy-intensive industries such as petrochemicals manufacture to developing countries where labor and natural resource costs are generally lower, (2) the aforementioned approaching saturation of energy-consuming goods in the richer nations, and (3) the developed world's greater continuing response to the energy price shocks of the past decade. For the world as a whole, energy demand per unit of economic activity will fall a consistent 1 percent per year.

World Energy Supply

Coal, nuclear power, and renewable energy sources will supply an increasing share of the world's energy needs in the years ahead. But the shift away from oil and gas has been slowed by their increased price competitiveness. As a result, oil and gas will still supply nearly three-fifths of the world's energy by 2000.

As illustrated in EXHIBIT 5, oil will meet one-fourth of the 32 MMBDOE of additional, or incremental, energy that the world will need by the end of the century. Gas will supply a smaller and declining share of incremental energy because a greater proportion of its demand is for substitutable uses (e.g., power generation). Relatively robust near-term growth in gas demand will be driven by exploitation of bountiful indigenous resources in the developing world and excess supplies in Western Europe, the United States, and Canada.

Coal's share of total energy supplies will stagnate at just over one-fifth for the remainder of the 1980s, due to declining price competitiveness. In the 1990s, however, coal will expand its share by providing one-third of the world's incremental energy needs. Most of coal's growth will come in the electric utility sector, where coal remains an attractive option for new baseload capacity, particularly in the United States. Metallurgical coal use for iron and steel production will grow slowly. Coal's ability to penetrate other industrial markets has been impaired by its diminished price advantage.

EXHIBIT 4

World Energy Demand & Economic Activity

(Barrels Oil Equivalent Per $1,000 of Goods and Services)

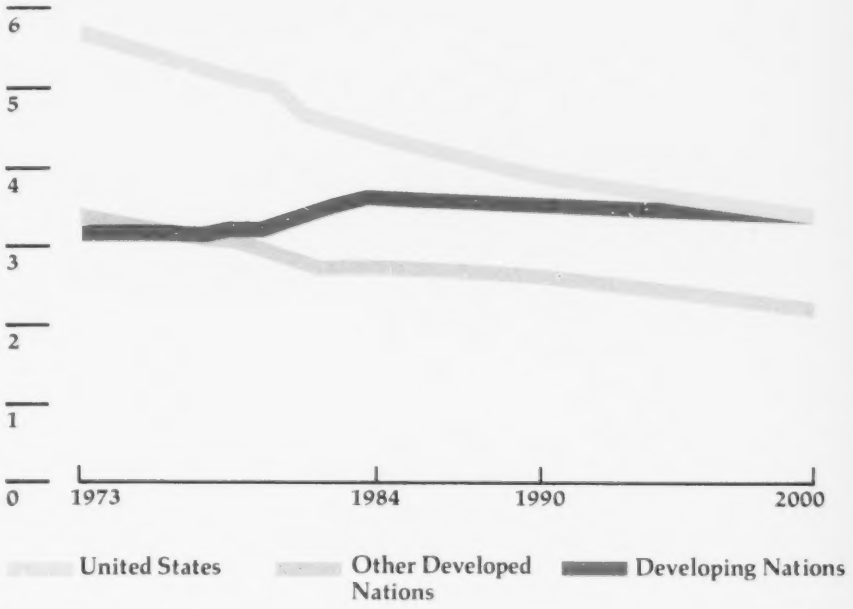


EXHIBIT 5

Shares of Incremental World Energy Supply

(Million Barrels Per Day Oil Equivalent)

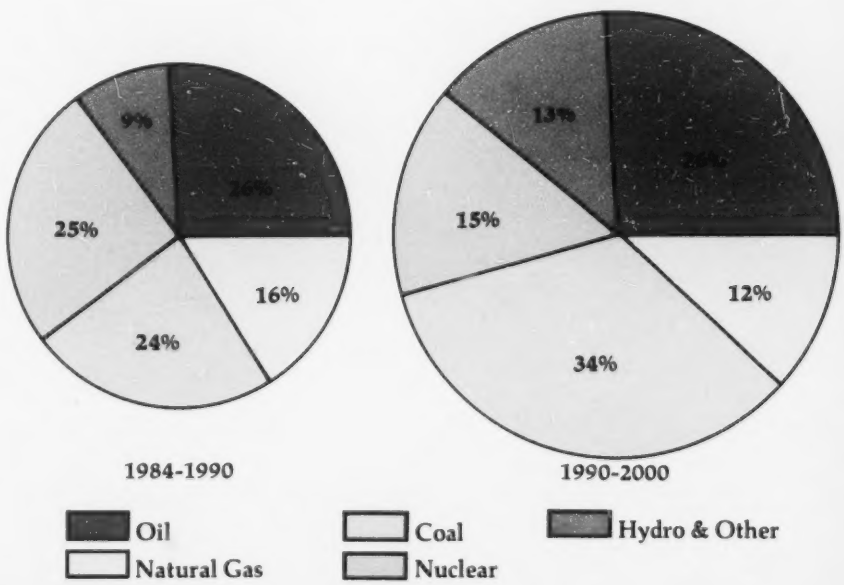


EXHIBIT 6

Regional World Oil Demand

(Million Barrels Per Day)

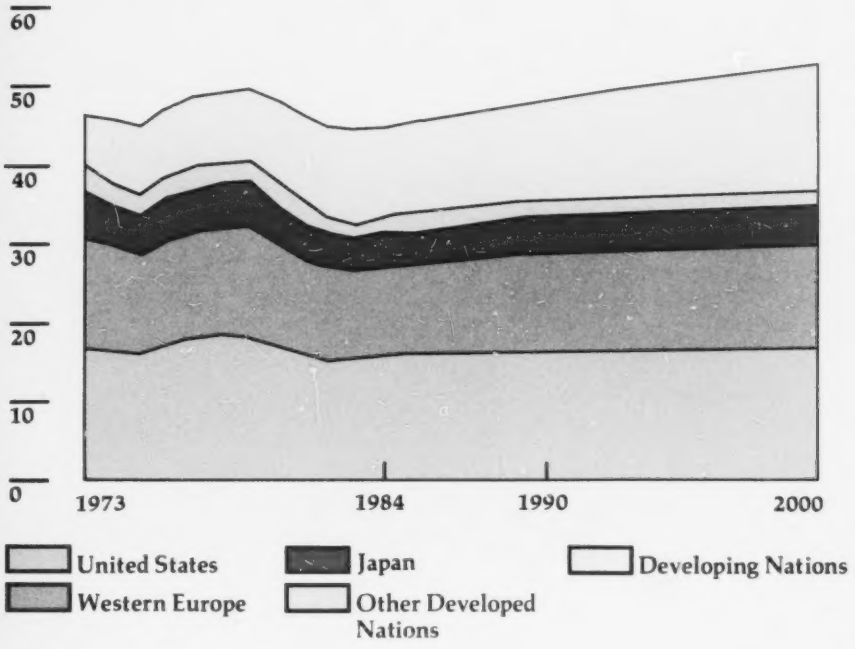
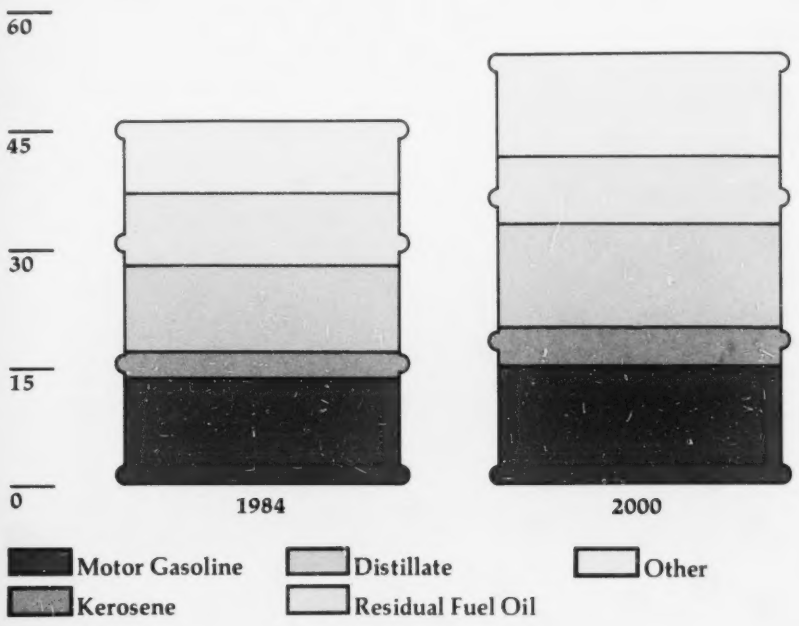


EXHIBIT 7

World Oil Product Demand

(Million Barrels Per Day)



Nuclear power will grow faster than any other energy form through 2000. Growth in nuclear power will be particularly robust over the remainder of the 1980s as most reactors currently under construction are completed. Thereafter, nuclear growth will moderate as rising costs limit expansion in many regions. New reactor orders will come primarily from Western Europe, Japan, and the developing world.

Hydropower and renewable energy sources will make only a modest contribution to the world's incremental energy needs over the remainder of the century. Fuller use of hydropower will come primarily in the developing world where vast untapped resources remain. Only a few developed countries, such as Canada, have both unexploited hydropower potential and a political environment that will allow its development. Other renewables, such as biomass, solar power, and wind power, will be constrained by their high cost.

World Oil Demand

World oil demand will grow 1 percent per year, with two-thirds of the total increase in the developing world. Demand for residual fuel oil will be stable while demand for other products grows modestly.

World oil demand will grow from 46 million barrels per day (MMBD) in 1984 to 49 MMBD in 1990 and 54 MMBD in the year 2000. The price shocks of the last decade will continue to restrain oil demand as the stock of oil-consuming equipment, particularly cars, turns over slowly. However, crude oil prices have declined 20 percent in dollar terms since 1981, which has stimulated oil demand. As EXHIBIT 6 shows, growth will be slower in the developed world where many non-oil energy projects such as coal and nuclear power plants and gas pipelines are currently under construction. Capital-intensive alternatives to oil are less prevalent in the Third World due to the large external debts of many developing countries. Nonetheless, even in the Third World, oil will constitute a declining share of energy use as every effort is made to conserve foreign exchange and exploit domestically produced alternatives.

EXHIBIT 7 portrays the changing mix of world oil product demand. Gasoline consumption will grow slowly but decline as a share of the product barrel due primarily to improvement of the fuel efficiency of the U.S. vehicle fleet. Growth in middle distillates demand will be relatively robust as expanded use of kerosene jet and diesel fuel offsets slow growth in consumption of heating oil, which will face generally stiff competition from gas and electricity in North America and Western Europe. Residual fuel oil demand will be fairly stable over

the remainder of the century. Given the oil price outlook, very few additional conversions out of fuel oil in the power and industrial sectors will go forward. Bunkering of ships, however, will expand with world trade. Of the other petroleum products, petrochemical feedstocks demand will grow strongly with industry output. Much of the growth will be in Third World countries with access to cheap feedstocks.

Excess refining capacity currently exists around the world. Given already low profitability, planned new refineries in OPEC and other developing countries could hasten the retirement of inefficient refineries in "old-line" refining centers such as the United States and Western Europe. Current refinery upgrading programs appear adequate to meet projected demand slates for the remainder of the 1980s. In the early 1990s, additional residual fuel oil conversion capability may be required.

World Oil Supply

Non-OPEC oil supplies will peak within the next few years. OPEC production of crude oil and natural gas liquids will grow to 28 MMBD in 2000 from 19 MMBD in 1984.

Lower crude oil price prospects have seriously discouraged exploration and development efforts in non-OPEC countries. As EXHIBIT 8 shows, this will lead to slowly declining total non-OPEC supplies in the 1990s. Most of the decline between now and the end of the century will be accounted for by 15 to 20 percent reductions in U.S. and North Sea production and vanishing exports from the Communist Bloc. Beyond 1990, Norway and Mexico are the only non-OPEC countries expected to add significant increments of oil production. Enhanced oil recovery (EOR) will provide less than 500,000 barrels per day of additional supplies by 2000. Almost all synthetic fuels projects are uneconomic given the crude price outlook.

Slowly rising demand and peaking non-OPEC supplies imply increasing reliance on OPEC oil in the years ahead. This trend is not readily apparent currently because more than a third of OPEC's production capacity stands idle and the predominant near-term price pressures are downward. But, by the early 1990s, most of OPEC's remaining excess capacity will be concentrated in countries such as Saudi Arabia with the least-pressing revenue needs. Simultaneously, OPEC's production will become increasingly concentrated in the Middle East, where the bulk of its reserves remain, but where the potential for supply interruptions is also higher. OPEC will also

EXHIBIT 8

Non-OPEC Oil Supply

(Million Barrels Per Day)

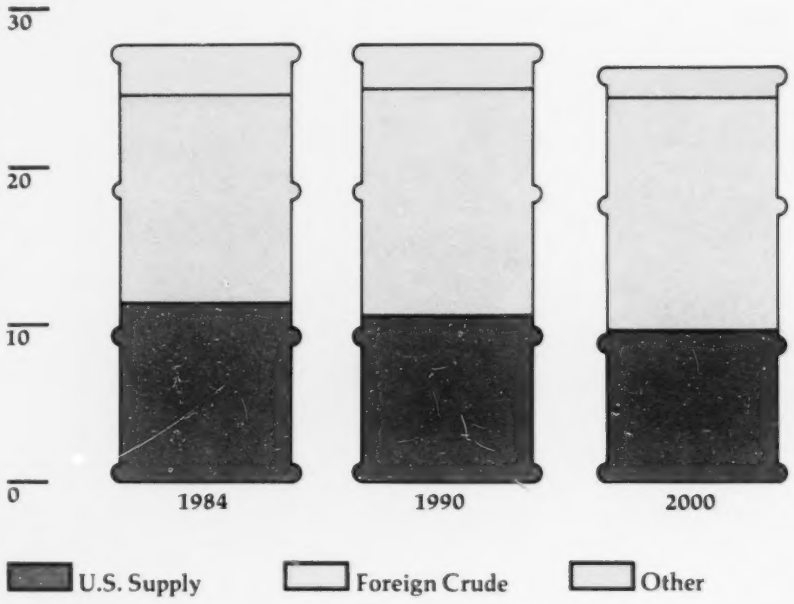


EXHIBIT 9

Shares of U.S. Energy Supply

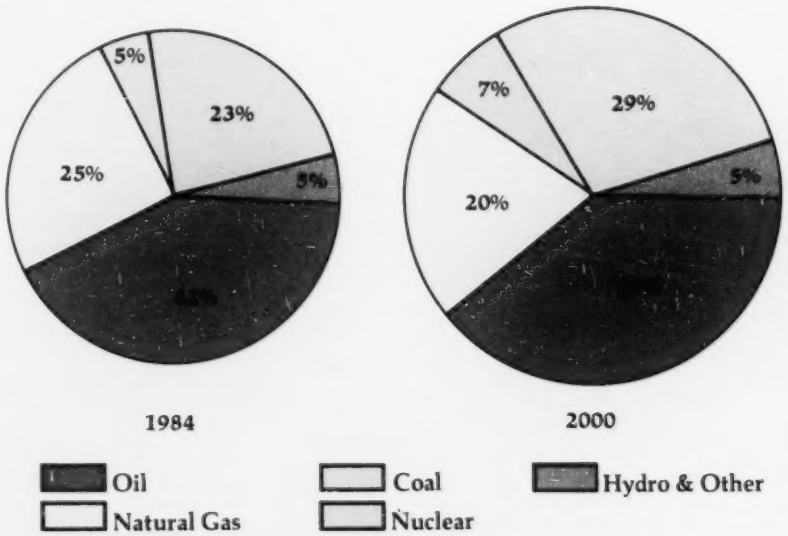
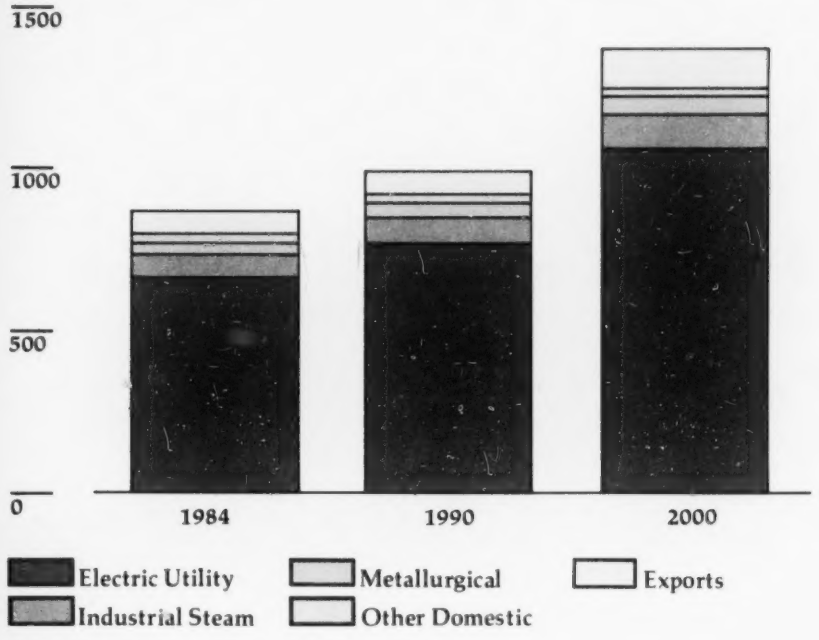


EXHIBIT 10

Demand for U.S. Coal

(Million Short Tons)



realize rapidly rising oil export revenues in the 1990s. Altogether, these factors will restore OPEC to a much more powerful position in world oil markets. In addition, OPEC oil output will be approaching effective capacity by the turn of the century, so the price impact of even a moderate supply disruption could be significant.

U.S. Energy Supply and Demand

U.S. energy demand will grow 1 percent per year, to 42 MMBDOE in 2000, about one-third the rate of economic growth. Coal and nuclear power will provide most of the nation's incremental energy, but oil consumption will also grow.

In the year 2000, the energy equivalent of 3½ barrels of oil will be consumed for each $1,000 (in constant 1980 dollars) of goods and services produced in the United States, down from 4½ barrels in 1984. This continued decline in the energy intensity of U.S. economic activity will be due to (1) the replacement of the capital stock with more energy-efficient equipment, (2) the changing makeup of industrial production, (3) saturation in many end-use markets, and (4) population shifts to warmer regions.

As illustrated in EXHIBIT 9, oil and gas will still supply nearly three-fifths of U.S. energy needs in 2000 as the shift toward other fuels is slowed by the current weakness in oil and gas prices. Some degree of dependence on oil is inevitable because transportation, which accounts for about one-quarter of U.S. energy demand currently, has limited substitution possibilities even under high oil price scenarios. Substitution for gas is also limited in certain industrial applications. Thus, control of the future level of import dependency is limited to the degree to which oil and gas can be backed out of uses where attractively priced alternative energy supplies are available.

U.S. Coal

Demand for U.S. coal will grow 2½ percent per year, reflecting increased domestic demand by electric utilities and industry and expanded steam coal exports. Currently weak oil and gas prices will prevent faster growth in demand for coal from the United States, the world's coal supplier of last resort.

As shown in EXHIBIT 10, electricity generation will continue to consume about three-fourths of domestic coal production. Coal demand growth will be strengthened in the 1990s by the lack of any acceptably priced, large-scale generation alternative for utilities after the present surge of nuclear power plant construction ends. Increased electric utility coal use is constrained by (1) the unattractiveness of additional conversion of oil- and gas-fired power plants, (2) electricity demand growth that slows to 1½ percent per year by the mid-1990s from 2½ percent over the remainder of the 1980s, and (3) potential acid rain legislation.

Industrial steam coal consumption will grow moderately due to (1) the construction of large, new industrial boilers and (2) completion of conversions from gas and oil that were begun earlier in the 1980s when oil and gas price expectations were higher. Technological advances in fluidized bed combustion of coal are stimulating industrial coal demand to a limited extent. Metallurgical coal demand growth will be minor, reflecting slow steel output growth and greater use of electric arc furnaces.

Total coal exports will expand from about 80 million short tons (MMST) in 1984 to nearly 130 MMST in 2000. Metallurgical coal exports will increase slowly due to rising steel output in countries with insufficient indigenous metallurgical coal supplies. Steam coal exports, which at less than 25 MMST were about 50 percent lower last year than in 1981, are forecast to recover only slowly through 1990 due to the high cost of mining and transporting domestic coal and competition from other coal exporting countries. Steam coal exports should grow more rapidly thereafter to more than 60 MMST in the year 2000 as rising real oil prices enhance the worldwide competitiveness of U.S. coal versus alternative fuels.

U.S. Nuclear Power

Nuclear electricity generation will increase 9 percent annually over the remainder of the 1980s but begin to decline in the 1990s.

As shown in EXHIBIT 11, nuclear power will expand its share of U.S. electricity generation significantly. However, the expansion will end by the early 1990s as most of the approximately three dozen reactors still under construction are completed. Despite an improving regulatory environment and softening public opposition, new reactor orders are not expected to materialize because of runaway capital costs and less-than-optimal reactor performance. Capacity utilization will begin to fall in the 1990s as reactors age, leading to lower nuclear generation.

U.S. Natural Gas

U.S. natural gas demand will expand from 17½ trillion cubic feet (TCF) in 1984 to 18 TCF in 1990 before falling to 17 TCF in 2000. A better balance of supply and demand should be achieved by the late 1980s.

Economic recovery and recent stabilization in natural gas prices have set the stage for a rebound in natural gas demand. Longer term, however, the retarding effect of rising gas prices will outweigh the stimulative impact of economic growth. Although the number of homes and offices fueled by gas will expand, the efficiency of new gas-fired equipment will be significantly better than the older types that are removed from service. Gas will continue to be backed out of the electricity sector by coal and nuclear power, particularly in the Southwest where much of the consumption remains.

As shown in EXHIBIT 12, maximum estimated deliverability of natural gas currently exceeds demand in the United States by 3 to 4 TCF, or about 20 percent. This surplus, along with declining oil prices, has led to stabilization of wellhead gas prices. Less attractive development economics in the near term and the depletion of low-cost reserves in the longer term will lead to a 1 percent annual decline in U.S. gas output to the year 2000. Imports, primarily from Canada, will rise to 2½ TCF in 2000 from 1 TCF in 1984. By the late 1980s, demand and deliverability will be more closely balanced.

In addition, the natural gas industry is undergoing significant structural changes that will make it more responsive to supply-demand trends. These changes include partial decontrol of gas prices under the Natural Gas Policy Act (NGPA), heightened competition between gas pipelines and producers for industrial customers, and the emergence of spot trading of gas.

EXHIBIT 11

Shares of U.S. Electricity Generation

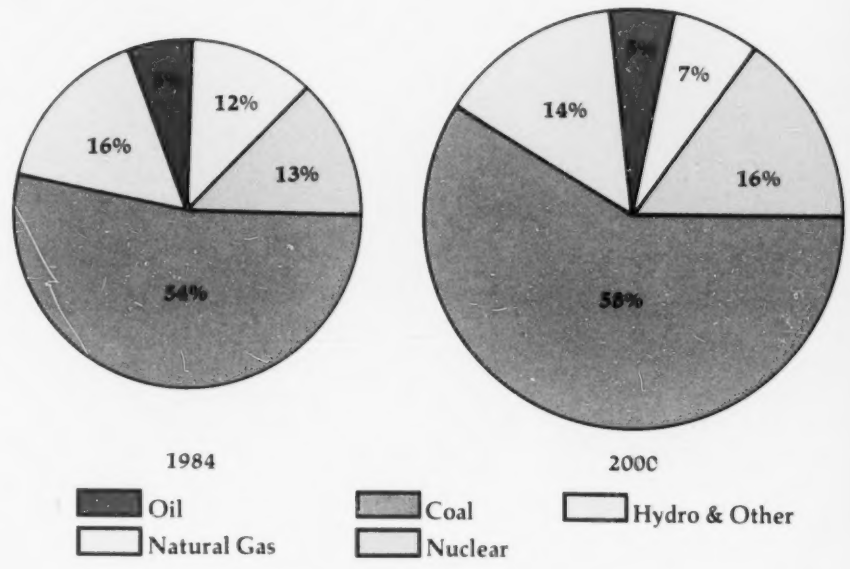


EXHIBIT 12

U.S. Natural Gas Supply and Demand

(Trillion Cubic Feet)

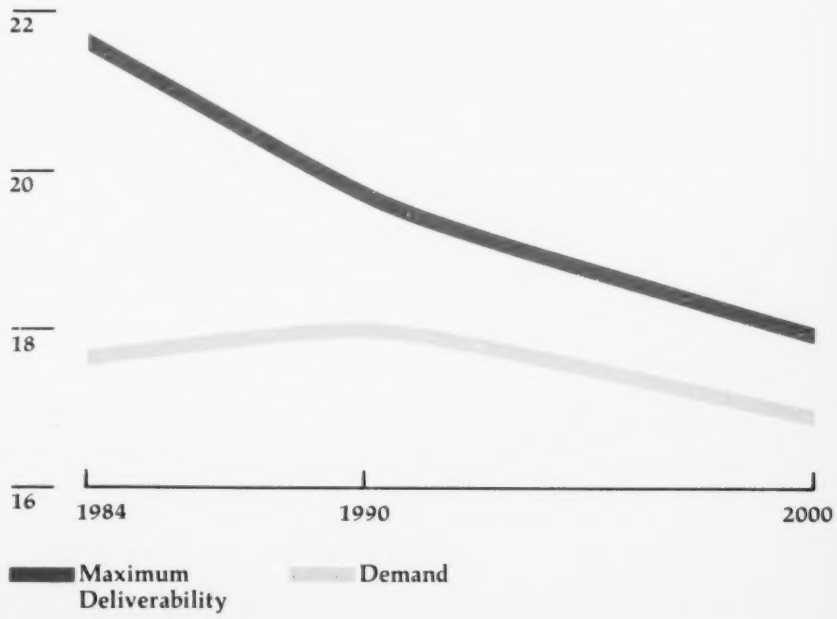


EXHIBIT 13

U.S. Oil Demand
(Million Barrels Per Day)

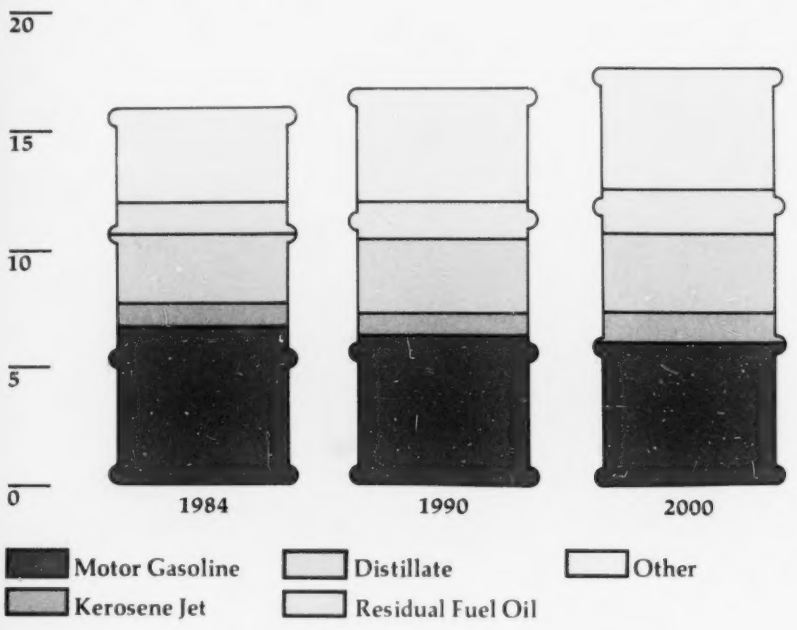
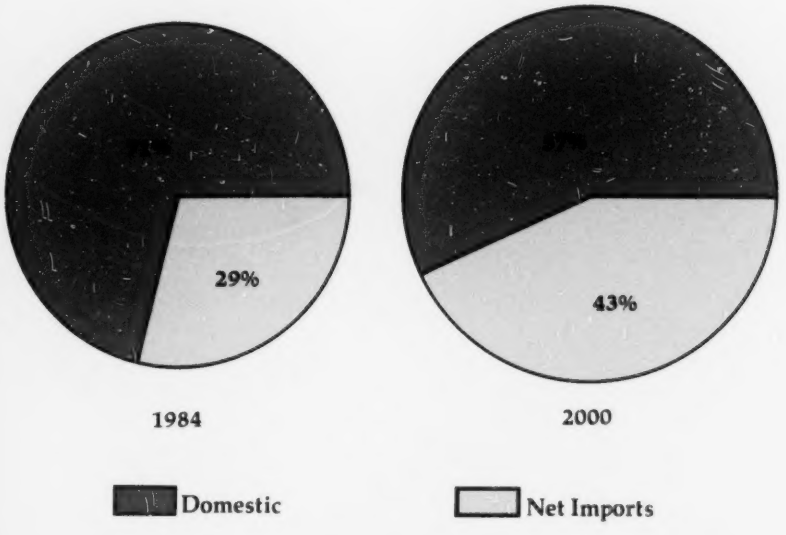


EXHIBIT 14

Sources of U.S. Oil Supply



U.S. Oil Demand

U.S. oil demand will increase from almost 16 MMBD in 1984 to 16½ MMBD in 1990 and more than 17 MMBD at the turn of the century. Gasoline consumption will continue to decline while demand for other products increases.

Despite near-term oil price weakness, U.S. oil demand will grow only ½ percent per year to 2000 as conservation and some fuel switching in response to earlier price increases continue. As EXHIBIT 13 demonstrates, the slow growth will be largely attributable to continued declines in consumption of gasoline, which accounts for more than two-fifths of U.S. oil demand currently. The average fuel efficiency of new autos is not expected to increase through 1990 because buyers are opting for larger, more powerful cars. Nonetheless, the average fuel efficiency of the total auto fleet will improve slowly as older, less-efficient cars are scrapped. Kerosene jet fuel demand will rise as increased air travel is only partially offset by improvements in aircraft fuel efficiency and load factors. Distillate consumption will grow slowly as freight transportation fuel use expands and other uses, including home heating, contract. Residual fuel oil consumption will expand slowly due to increased bunkering of maritime vessels and rising use for power generation. Demand for other petroleum products will expand on the strength of increased feedstock use by the petrochemical industry and increased asphalt consumption for highway reconstruction.

U.S. Oil Supply

Domestic oil supplies will decline 1 percent annually to 2000. Net oil imports will rise from 4½ MMBD in 1984 to 7½ MMBD by 2000.

U.S. crude oil output will decline inexorably as larger, currently producing fields are depleted. Even Alaskan production will decline in the 1990s as new developments fail to offset falling output from Prudhoe Bay. Increased production offshore California, one of the hottest domestic exploration plays currently, will be insufficient to offset the decrease in other Lower-48 crude production. Natural gas liquids will decline in line with falling domestic gas output. Synthetic liquids from coal and shale oil are not commercially viable given the crude price outlook, so they will contribute less than 100,000 barrels per day to domestic supplies by 2000.

As illustrated in EXHIBIT 14, the result will be an increase in U.S. reliance on net imports from 29 percent of oil demand in 1984 to 43 percent in 2000. Thus, by the turn of the century, import dependence

will have returned to the level that existed immediately prior to the energy price shock induced by the Iranian Revolution.

Capital Requirements

The U.S. petroleum industry will require about $300 billion of capital investment through 1990. Most of the investment will be in the upstream side of the business.

To provide the domestic oil and natural gas supplies projected in this outlook for the remainder of the 1980s, the U.S. petroleum industry will have to invest roughly $300 billion during the 1985-1990 period. This is three times average annual expenditures during the 1970s when price controls held down U.S. crude oil and natural gas prices. These massive capital outlays will be required at a time when the industry's internal cash-generation capability has been impaired by lower oil prices. Moreover, proposed government fiscal measures could reduce industry cash flow even further. As shown in EXHIBIT 15, capital spending will need to accelerate in the late 1980s as the gas "bubble" disappears and costs rise with prices.

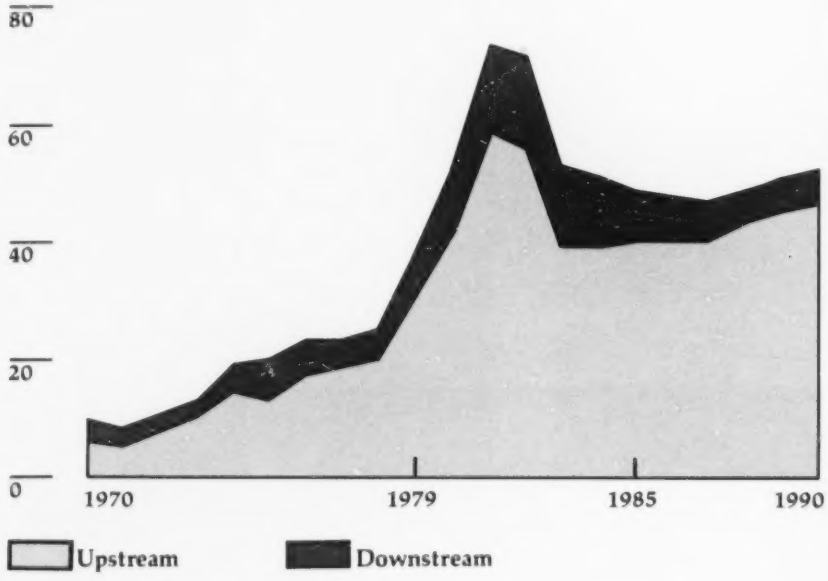
Exploration, development, and production, the upstream side of the business, will continue to require the bulk of the U.S. petroleum industry's capital outlays. Despite lowered oil price expectations, some $250 billion will need to be invested from 1985 through 1990. This is only slightly less than spending during 1979-1984, which included unusually high outlays in 1981 and 1982 due to sharply higher world oil prices, expectations of future price increases, and U.S. oil price decontrol. A $250-billion upstream investment program is consistent with (1) a continued historically high level of drilling activity of around 80,000 wells per year, (2) stable to slowly rising expenditures per well, (3) historical average reserve additions per well, and (4) maintenance of reserves at eight to nine years of production. Nonetheless, U.S. oil and gas production will decline 1 percent annually even with an investment program of this magnitude. An additional $50 billion of upstream investment would be required to maintain domestic oil and gas production at current levels.

The downstream sector — refining, transportation, and marketing — will require a lesser share of petroleum industry investment in the future due to current excess capacity. Nonetheless, about $40 billion will be needed over the 1985-1990 period to maintain and upgrade existing capacity. That is roughly the same as average annual downstream spending in the 1970s. Federal regulations requiring phasedown of lead in gasoline will require significant investment in the octane enhancement capability of U.S. refineries. Also, considerable investment will be required to rationalize the natural gas and petroleum products pipeline networks to meet market needs.

EXHIBIT 15

U.S. Petroleum Industry Capital Requirements

(Billion Dollars)



The U.S. petroleum industry is capable of obtaining the necessary funds for this aggressive investment program, either from internal sources or financial markets. This ability to fund required investment programs assumes that changes in taxation policies or other government regulations do not impair the industry's cash-generation capability.

In addition to the petroleum industry, the U.S. coal industry will require an estimated $15 billion through 1990 to maintain existing mines and provide for anticipated growth in coal production. Electric utilities also will have substantial capital requirements over the remainder of the decade.

Policy Implications

The United States will become increasingly dependent on potentially interruptible foreign oil supplies in the years ahead as oil demand grows very modestly but steadily and — despite the hundreds of billions of dollars that will be invested in exploration, development, and production — domestic oil production erodes. Past oil supply disruptions, which resulted in significantly reduced economic activity and employment, have occurred when import dependency was high. Thus, it is imperative that we as a nation take steps now that will reduce our vulnerability to future oil supply interruptions.

Building up the Strategic Petroleum Reserve to the targeted level of 750 million barrels, as quickly as is fiscally responsible, is an important step toward insulating ourselves from an oil supply disruption. Emphasis must also be placed on finding and developing additional oil supplies in the United States and other politically stable areas. Unfortunately, the current softness in world crude prices discourages investments to develop such supplies because of high costs and risks. Therefore, it remains imperative that government policies encourage the major new investments that need to be made today by the U.S. energy industry if adequate and affordable energy supplies are to be available to future generations.

The attention of the nation has shifted from energy availability to tax reform and deficit reduction. Efforts in these areas must remain sensitive to the goal of energy security. Changes in tax laws and regulatory policies should facilitate the production of diverse energy resources. These policies should also ensure that the U.S. energy

industry is treated on an equitable basis vis-a-vis other domestic industries and that it can compete against foreign national oil companies for access to worldwide energy supplies.

To achieve these ends, we must diligently pursue the following government policies:

Ensure an equitable tax regime for energy development.

Comprehensive overhauls of the individual and corporate income tax systems have been proposed by the Administration and by members of both parties in the Congress. Included in these proposals are the repeal of the option of immediately expensing intangible drilling costs and the repeal of the percentage depletion allowance on coal. Repeal of these provisions would reduce the incentive to invest in energy exploration, development, and production.

The more general provisions of the tax reform proposals could have an even greater impact on investment and production in the energy industry than the energy-specific provisions. Repeal of the Investment Tax Credit, replacement of the Accelerated Cost Recovery System with more gradual depreciation deductions, and elimination of the special treatment of capital gains at the individual level would discourage investment generally. However, investment incentives would be particularly impaired in the energy industry because of its massive capital requirements,which are subject to a great deal of risk.

The greatest danger associated with these tax proposals is that pressures to reduce the federal budget deficit may cause Congress to enact measures to broaden the tax base, particularly on the corporate side, without reducing tax rates as much as proposed. Such action would have a devastating impact on cash flow in the energy industry and would further discourage investment in new productive capacity.

In order to stimulate investment by the U.S. energy industry in developing diverse energy supplies, federal tax policies should:

- Avoid singling out the energy industry for drastic increases in tax burdens. Additional revenue needs should be raised through broad-based taxes on consumption, not on savings, investment, or factors of production.
- Take state severance taxes into account when determining the proper tax burden on energy at the federal level.
- Attempt to achieve neutrality in investment incentives by moving toward the expensing of all investment expenditures, not away from the expensing of intangible drilling and development costs.

Recognize that increased energy production and high environmental standards are not incompatible goals.

Environmental protection policies can impose costs and delays on the development of energy supplies as well as increase the costs of refining and using energy resources. Further, compliance with environmental regulations requires the diversion of capital and manpower from the primary task of investment in energy production. It is therefore critical that federal, state, and local governments remain sensitive to the impact that environmental policies can have on energy development and the continued competitiveness of the U.S. energy industry. The industry has built a strong record of conducting its activities in a manner consistent with national goals for environmental protection. Adequate environmental protection is an immutable national goal. However, a reasonable balancing of environmental, energy, and economic interests must serve as the basis for environmental policy.

In order to achieve adequate development of energy resources, federal, state, and local environmental policies should:

- Ensure that Superfund, which finances the cleanup of abandoned waste sites, is properly funded. However, crude oil should not bear a disproportionate tax burden in financing the Superfund programs.
- Avoid the adoption of acid rain control programs that require substantial investment in air pollution control equipment without the scientific foundation to assure that costs will be commensurate with the expected benefits.
- More generally, avoid a "zero risk" approach to environmental protection. The costs of environmental regulations should be justified by the benefits that would be derived from the regulations.
- Ensure the right of citizens to obtain information about hazardous substances present at industrial facilities in their communities. The programs adopted should make maximum use of existing documents prepared by industry.

Ensure the availability of public lands with high energy potential.

If we are to slow the projected decline in domestic oil and gas production, acreage having the greatest petroleum potential must be given the highest priority in exploration efforts. Virtually all of the unexplored, high-potential acreage is in offshore federal areas and onshore federal lands. Although access to these areas is technically controlled by federal policy, state governments are increasingly active, insisting upon a role in setting this policy.

Access to many of these prime prospects has been precluded in recent years by leasing moratoria and formal withdrawals by Congress. In addition, state actions designed to assert their interests in federal leasing policy are resulting in further acreage restrictions. Exclusion of such highly prospective acreage directly reduces the ability of the United States to replace reserves and results in greater dependence on petroleum imports.

To promote domestic energy production, federal and state policies should:

- Abandon leasing moratoria and other blanket leasing prohibitions that are insensitive to the petroleum potential of the affected acreage.
- Avoid including acreage with high petroleum potential in new wilderness or other designations that prohibit oil and gas leasing.
- Consider revenue sharing with the coastal states that would compensate them for risks associated with Outer Continental Shelf activity off their shores.

Under the current market environment, the U.S. energy industry is not as able to cope with ill-advised or shortsighted government policy as it has been in the past. Therefore, effective action in these three areas is vital if we are to reduce our vulnerability to any future oil supply disruptions.

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Printed in U.S.A.

B2560-1-U

World Energy Outlook

Through 2000

conoco

September 1986

Introduction

The dramatic collapse of crude oil markets in early 1986 was the result of forces set in motion by the high oil prices of previous years. Reductions in oil demand due to conservation and the substitution of alternative fuels, along with steady increases in non OPEC oil production, cut OPEC's market share. A disproportionate share of the burden of reducing production was borne by Saudi Arabia. In 1985, Saudi production fell to an average of 3.2 million barrels per day (MMBD) from 9.8 MMBD as recently as 1981. Total OPEC crude production dropped to 16.1 MMBD in 1985, down from 30.8 MMBD in 1979. Eventually, the problem of parceling out shares of a shrinking market became insurmountable. Prices had to fall to accommodate an increase in OPEC production.

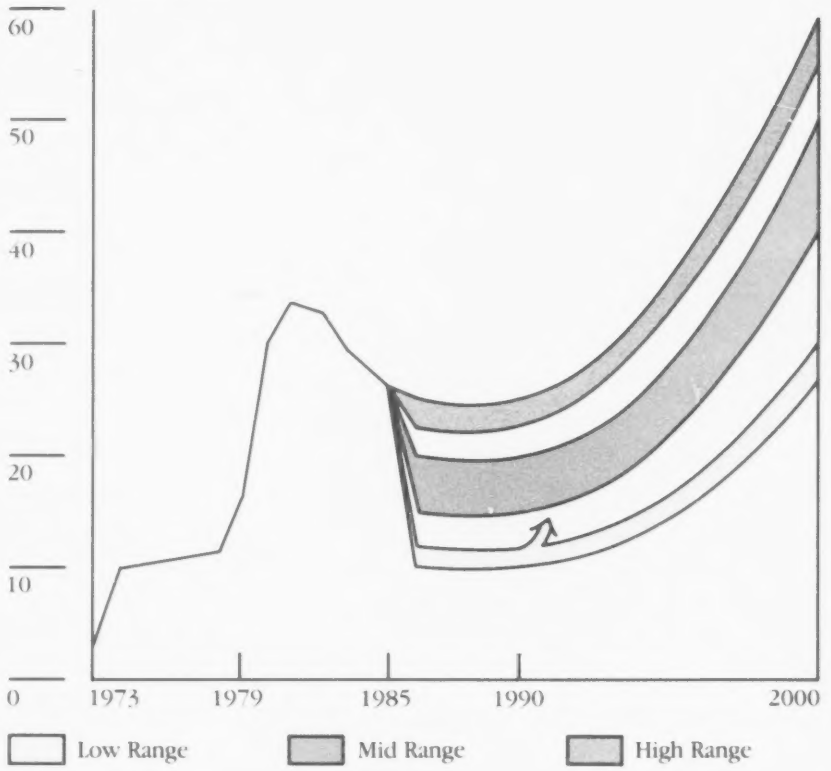
The first signs of the impact of the price collapse are already apparent. Some industrial and electric utility plants in the United States, Western Europe, and Japan have switched from coal or gas to oil. **High-cost oil producers have shut down wells. Exploration and development expenditures have been slashed.** There also have been significant effects on the global economy, which is not surprising since oil still accounts for 46 percent of the world's energy supply. Inflation and interest rates have fallen, and wealth has been transferred from oil producers to consumers. This pattern represents the mirror image of the events following the 1973-74 and 1979-80 oil price increases, and may portend a period of healthy, sustained economic growth for the United States and other oil importers. Nevertheless, even this optimistic view has a negative aspect: Just as high real oil prices diminished oil's share of world energy markets, **lower oil prices will lead to increasing reliance on imported oil.** Since the world's oil reserves are still concentrated in regions where there is a significant potential for supply disruption, **rising import dependence means (1) a higher risk of an economically damaging shortfall, (2) reduced flexibility in formulating and implementing foreign policy, and (3) greater military obligations to safeguard vital supply links.** At the same time, the ability to respond with an increase in domestic supply will be greatly diminished.

The challenge for the U.S. government in particular is to develop policies that permit consumers to benefit from lower oil prices while minimizing the risks of future import dependence. The difficulty of this task is amplified by uncertainty about when and at what level oil prices will stabilize. Planners deal with uncertainty by developing several scenarios that bracket the most likely outcome. Thus, this assessment of the world energy outlook considers high-, low-, and mid-range cases (see EXHIBIT 1), with the mid-range case explored in detail. Some policy implications are sufficiently robust as to apply in all cases. These are discussed at the conclusion of the outlook.

EXHIBIT 1

Crude Oil Price Scenarios

(Current Dollars Per Barrel)



Key Factors

This outlook is based on developments in several key factors that play important roles in determining energy supply and demand. There have been changes since last year's outlook. Some of these are noted below.

Oil Prices. The supply and demand projections presented in this outlook are consistent with the mid-range price scenario mentioned above. (Note that prices are in current dollars and reflect U.S. inflation averaging nearly 4 percent per year.) In this scenario, **crude oil prices fluctuate between $15 and $20 per barrel through 1990.** Increased volatility could temporarily send prices above $20 per barrel or significantly below $15 per barrel. However, a combination of market forces and production restraint by OPEC (and perhaps some non-OPEC producers) would restore prices to the $15-$20 per barrel range. **During the 1990s, as the supply-demand balance tightens, prices begin to move up rapidly, reaching $40-$50 per barrel in 2000.** Nevertheless, prices are expected to remain below the range anticipated a year ago. Note that this scenario does not consider such possibilities as an extended supply disruption or a severe economic downturn.

Economic Growth. **Non-Communist world economies will grow at an average rate of just over 3 percent per year,** as expected last year. The U.S. economy will grow at a rate of slightly less than 3 percent per year. Prospects for growth in Japan and Western Europe have improved to 4½ percent and more than 2½ percent per year, respectively, because of their status as oil importers. Among developing countries, the benefits of lower oil prices to net oil importers will outweigh the negative impact on oil exporters, and growth should average close to 4 percent per year overall.

EXHIBIT 2

World Energy Demand

(Million Barrels Per Day Oil Equivalent)

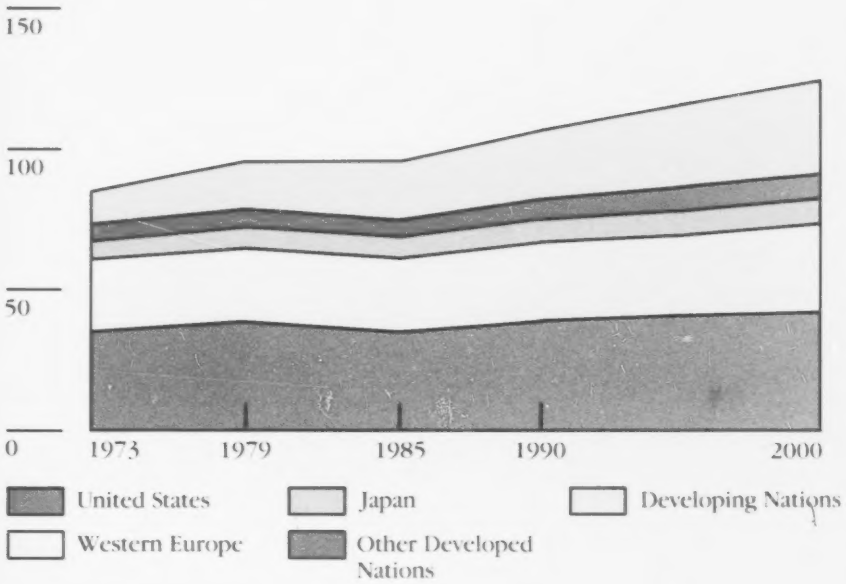


EXHIBIT 3

World Energy Demand & Economic Activity

(Barrels of Oil Equivalent Per $1,000 of Goods and Services)

Natural Gas Prices. **Natural gas is expected to remain competitive with oil products in most markets through 2000.** Some regions of the United States where gas transmission and distribution costs are high, however, may find oil cheaper than gas.

Coal Prices. Because of lower oil and gas prices, coal no longer has a clear-cut economic advantage in new boilers, even in relatively large units. In fact, with oil prices near the lower end of the mid range, a few plants now using coal may switch to oil. Although substantial excess capacity exists in the coal industry at present, few producers can reduce prices significantly and continue to operate. As a result, **coal prices will fall only slightly before stabilizing. In the long run, prices will increase gradually, limited by productivity gains and expansion of low-cost capacity worldwide.**

Nuclear Power. **High plant construction costs and safety concerns will limit the growth of nuclear power.** No new capacity beyond what already is under construction will be added in the United States. In Western Europe, Japan, and some developing countries, nuclear programs will go forward, but at a slower pace than in recent years. Nuclear power economics are questionable with oil prices below $20 per barrel, but the motive to diversify energy supplies remains in force.

Renewables. Energy from renewable sources such as biomass, wind, and solar power will make a limited contribution to energy supplies. In most cases, the renewable technology will not be competitive with combustion of conventional fossil fuels.

Note: Throughout the Outlook, the "world" is defined as the non Communist world. Only the net energy trade of the Communist Bloc is counted in world energy supply demand balances. The developed world refers to member countries of the Organization for Economic Cooperation and Development (OECD). The developing world, sometimes called the Third World, refers to the remaining non Communist nations.

World Energy Demand

World energy demand will grow slightly faster than 2 percent per year during the second half of the 1980s and 1½ percent per year during the 1990s. Developing countries will account for nearly half of the total increase, although they currently represent less than a quarter of demand.

As EXHIBIT 2 shows, world energy demand will increase from 96 million barrels per day of oil equivalent (MMBDOE) in 1985 to 107 MMBDOE in 1990 and 125 MMBDOE in 2000. Energy use in the developing countries will grow at more than 3 percent per year. Energy consumption in the developed countries will grow at less than half that rate.

On average, the developing countries will experience faster economic and population growth and will attract a greater share of energy-intensive manufacturing capacity than will the developed countries. As per capita incomes rise in the developing countries, per capita energy consumption will also increase from current low levels.

As EXHIBIT 3 indicates, energy intensity (energy use per unit of economic activity) will remain fairly stable in the developing countries. However, in the developed countries, shifts in the composition of economic output, together with continuing efficiency gains and saturation of some uses, will force energy intensity lower. World energy intensity is expected to decline 1½ percent per year.

Factors responsible for the continued decline (even in a low oil price environment) include (1) completion of conservation investments initiated when prices were higher, (2) incorporation of cost effective, energy saving technology in new capacity and retrofits, and (3) expectations that low prices are temporary. Regulation induced conservation (e.g., U.S. new car fuel economy standards) also will play a role. If efficiency gains are smaller than expected, total energy requirements in general and oil consumption in particular will be higher, and reliance on OPEC will be greater.

World Energy Supply

Coal and oil will provide the largest absolute increases in energy supply, while nuclear will experience the fastest growth. Oil will continue to supply over 40 percent of total world energy requirements in 2000; oil and gas together will supply over 60 percent.

Oil will contribute a little under 30 percent of the growth in world requirements from 1985-2000. As a result, oil's share of world energy supply will decline from 46 percent to 42 percent (see EXHIBIT 4). Although oil is now far more competitive with other fuels than in recent years, several factors will cause its share to fall: (1) expectations of a price rebound, (2) higher consumer taxes on oil products, (3) completion of conservation projects already begun, and (4) the desire of many developing countries to exploit indigenous gas and coal resources for internal development and conservation of foreign exchange.

The share of world energy supplied by natural gas will remain constant at about 18 percent. However, the constancy of the global share obscures conflicting regional trends. For example, the share of natural gas will decline in the United States, but it will rise in virtually all other regions as (1) low-cost abundant gas reserves are exploited for power generation, petrochemical feedstock, or other industrial applications; (2) countries seek to diversify their energy supply mixes; and (3) environmental concerns favor gas over oil or coal.

Although the price advantage coal has maintained over oil and gas has eroded, coal will still make a significant contribution to incremental energy requirements. Several regions currently possess underutilized coal fired electric generating capacity that will be put into service as electricity demand increases. Furthermore, relative to oil and gas, coal is seen as a secure long term choice for fueling new capacity. Many developing countries will opt for coal over nuclear energy because of lower initial capital costs and simpler technology. Finally, developments in coal burning technology,

EXHIBIT 4

World Energy Supply

(Million Barrels Per Day Oil Equivalent)

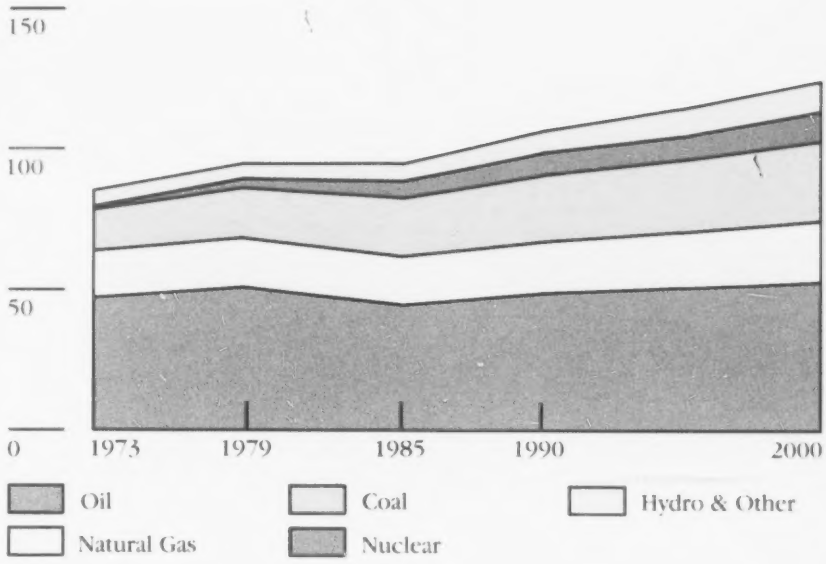


EXHIBIT 5

World Oil Product Demand

(Million Barrels Per Day)

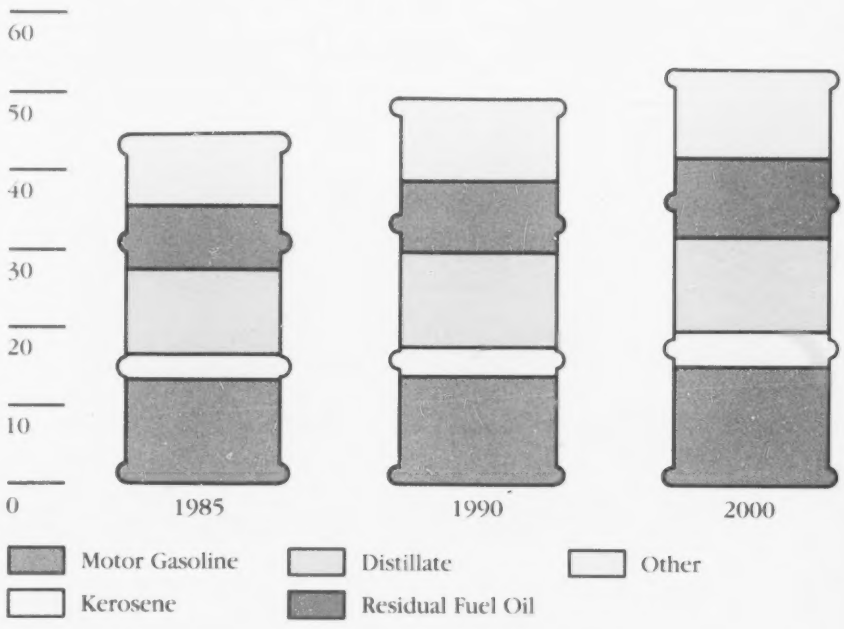
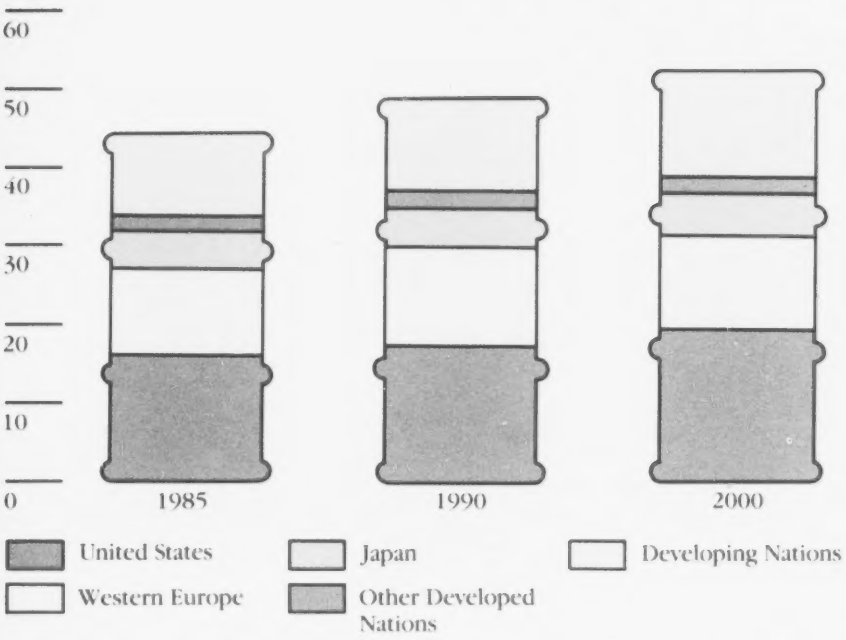


EXHIBIT 6

Regional World Oil Demand
(Million Barrels Per Day)



such as fluidized bed combustion and low BTU gasification, will hold down the cost of compliance with environmental regulations.

Nuclear power will be the fastest growing energy source, rising over 4 percent per year, with the most rapid growth during the next several years. However, its absolute contribution will be less than 20 percent of incremental energy supply, far less than previously expected. Once plants currently under construction are completed, little additional capacity will be added. A combination of high capital costs, low alternative fuel prices, and safety concerns stemming from the Soviet reactor accident in April 1986 will constrain growth in nuclear power.

Hydroelectric and other renewable energy sources such as wind and solar power will make small contributions to incremental energy requirements. With the exception of Canada, developed countries have already made use of most potential hydroelectric sites. Further development of Canadian hydro resources will depend on availability of a U.S. market for the additional exported power. Developing countries will take advantage of hydro resources to provide much-needed power for electrification/modernization. Of course, capital constraints could slow development. Geothermal, wind, solar, and biomass will continue to play limited roles in world energy supply through 2000.

World Oil Demand

World oil demand will grow just over 1 percent per year through 2000 with slightly faster growth in developing countries than in developed countries. All major products will contribute to demand increases.

World consumption of oil products, shown in EXHIBIT 5, will rise from 45 MMBD in 1985 to 53 MMBD in 2000. Continued improvement in the efficiency of oil use, expansion of alternative energy supplies, and concern over future price increases will hold down growth in oil consumption. Lower prices will bolster demand, but it will take many years to reverse the effects of previous high prices, and some changes may be irreversible.

Gasoline consumption over the period is expected to increase by 1½ MMBD, limited by (1) continued improvement in average vehicle efficiency, particularly in the United States; (2) increased consumer taxes and higher refining costs (due to the phase out of lead additives), both offsetting part of the impact of lower feedstock costs; and (3) market penetration by diesel passenger cars outside the United States.

Demand for middle distillates—kerosene and diesel—will be the fastest growing. Kerosene demand over the period is expected to rise by over 1 MMBD. Distillate fuel oil, which includes highway diesel and heating oils, will increase by 2 MMBD. In both cases, transportation use will grow faster than heating and cooking applications, where natural gas, liquefied petroleum gases, and electricity will provide strong competition.

Because of its lower price, residual fuel oil will be much more competitive with gas and coal in industrial and utility boilers. Fuel oil consumption is expected to rise by about 1½ MMBD by the year 2000, compared with previous expectations of flat to declining use at higher prices.

Other petroleum products, consisting primarily of liquefied petroleum gases, petrochemical feedstocks, lubricants, and paving materials, will rise by nearly 2 MMBD. In most cases, substitutes for these products are limited.

EXHIBIT 6 displays a regional breakdown of oil demand. Demand in developed countries will rise by less than 1 percent per year. Increases will be small in Western Europe, where ample gas supplies will be available. Demand will grow somewhat faster in the United States because of limited domestic gas availability, and in Japan because of higher economic growth. The largest gains will occur in developing countries because of rapid growth in population and economic output, and a lack of sufficient infrastructure to support massive substitution of gas or coal.

World crude oil distillation capacity is expected to be adequate to meet expected product demand. However, additional capacity to upgrade the heavy fraction of the barrel may be required by the early 1990s.

World Oil Supply

Non-OPEC production peaked in 1985 and will decline steadily as the oil price collapse depresses exploration and development activity. Market shares of OPEC producers with abundant low-cost reserves will rise dramatically.

Past increases in non-OPEC crude oil production have been an important factor in OPEC's loss of market power. High oil prices stimulated exploration for new reserves and made expensive development projects possible. In the United States, drilling activity soared to new highs and production declines were reversed. OPEC's share of world oil supply declined from 59 percent in 1979 to 38 percent in 1985.

More recently, lower prices have caused non-OPEC supplies to decline, and this trend will continue. The United States will be hardest hit because discoveries are smaller on average and have higher unit costs. Many of the enhanced oil recovery (EOR) projects that had been expected to sustain output will not be economically feasible. Canada and the United Kingdom will also experience relatively large production declines. In the near term, only Mexico and Norway appear capable of expanding production significantly. Total non-OPEC crude oil production will decline steadily from 22½ MMBD in 1985 to 18½ MMBD in 2000. The downward trend will not be reversed by the anticipated rapid price rises in the 1990s. Moreover, net exports from the Communist Bloc will end by the mid-1990s as demand rises and supply slowly declines. The region is likely to be a net importer by 2000.

In conjunction with steady demand growth, the decline in non-OPEC supplies will lead to rapidly growing dependence on OPEC oil, as shown in EXHIBIT 7. OPEC's share of supply is expected to reach 60 [illegible] percent by 2000, comparable to the levels of dependence seen during the 1970s. Furthermore, as EXHIBIT 8 indicates, OPEC dominates world oil reserves, and most of these reserves are concentrated among the Middle East members. As OPEC production expands, OPEC producers outside the Middle East will reach capacity, leaving incremental supply requirements to the Middle East exporters. By the mid-1990s, their production will also approach current capacity. At the same time, rising export revenues may reduce their desire to boost production and capacity further, setting the stage for a significant price hike. The likelihood of another destabilizing supply disruption will also increase.

EXHIBIT 7

Sources of World Oil Supply

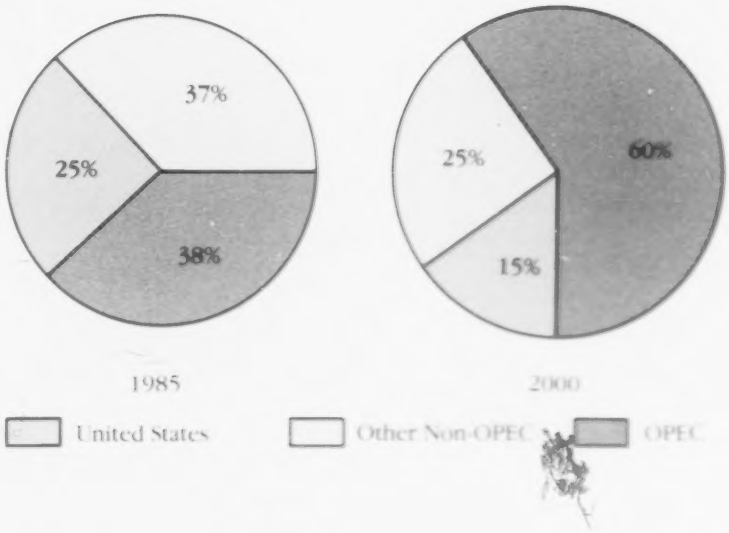
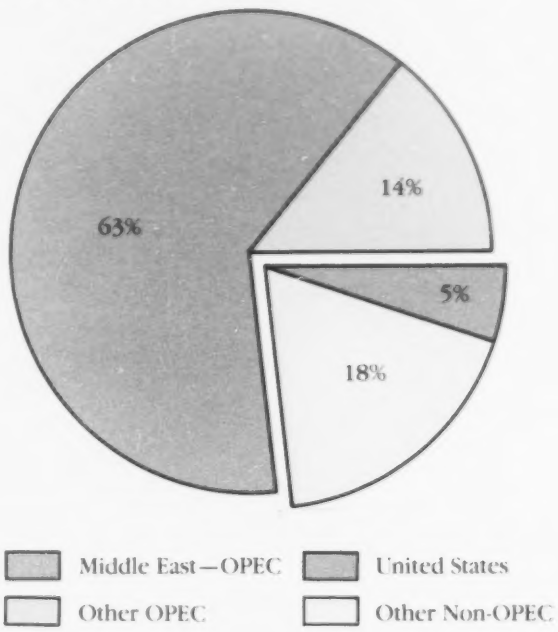


EXHIBIT 8

Shares of Proved Oil Reserves



U.S. Energy Supply and Demand

U.S. energy demand will grow 1 percent per year. Oil will supply more than half of the resulting increase in energy requirements, while coal and nuclear power together will supply the remainder. Natural gas use will decline slightly.

U.S. energy intensity will decline 2 percent per year from 1985-2000. Despite lower oil prices, average energy efficiency will rise as (1) new capital equipment and structures require less energy than the existing stock, (2) cogeneration increases, and (3) the economy continues to shift toward less energy intensive services and light manufacturing.

EXHIBIT 9

U.S. Energy Supply
(Million Barrels Per Day Oil Equivalent)

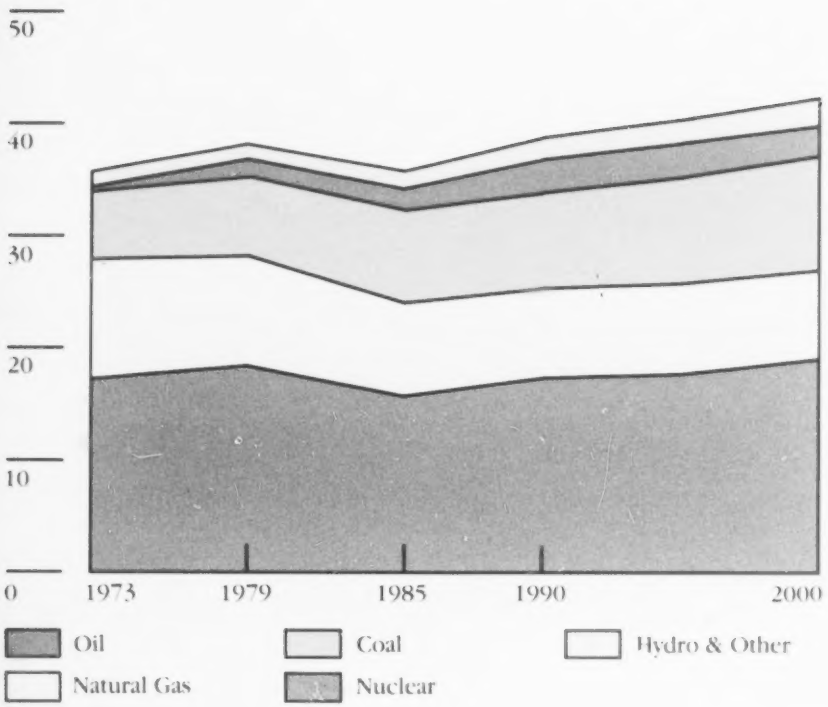


EXHIBIT 10

U.S. Natural Gas Supply & Demand
(Trillion Cubic Feet)

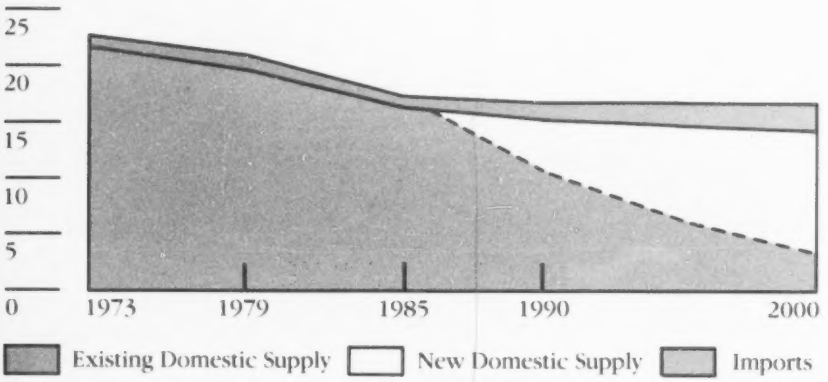


EXHIBIT 9 depicts the future pattern of U.S. energy supply. Oil will make the largest contribution to incremental U.S. energy requirements. Utility and industrial oil demand will increase through rising utilization of capacity currently idle and through switching from natural gas.

Natural gas use will trend downward as prices low enough to be competitive with fuel oil do not permit development of adequate reserves to hold supply steady. Coal use will increase slowly, mainly in existing utility capacity. Nuclear energy will increase rapidly through the late 1980s as the last of the plants under construction are completed. Afterward, nuclear energy output will trend down as no new plants are anticipated.

U.S. Natural Gas

U.S. natural gas demand will drop as the initial impact of lower oil prices is felt. However, drastically reduced drilling will cause supplies to shrink and will eliminate the present surplus by the late 1980s.

Falling oil prices, weakness in the manufacturing sector, and new nuclear generating capacity will cause industrial and electric utility gas demand to fall in the near term. Gas demand is expected to stabilize at lower levels within the next few years, with continued weakness in boiler fuel and feedstock markets offset by development of markets including combined cycle electric generating capacity, industrial and commercial cogeneration, and co-firing with coal to meet environmental standards.

Low prices will discourage gas well drilling, causing the gas surplus to shrink. EXHIBIT 10 indicates the likely outlook for gas markets, including the timing of the requirement for new domestic capacity. Gas prices, currently depressed by lower oil prices and excess gas supplies, will eventually recover, stimulating the increased drilling needed to provide this capacity. Imports will also increase, maintaining adequate gas supplies and moderating the rate of increase in prices.

U.S. Coal

Demand for U.S. coal, including net exports, will rise by 1½ percent per year to over 1.1 billion tons by 2000. The electric utility sector will remain coal's principal market, accounting for over three-fourths of coal output.

Electricity demand growth of only 1½ per cent per year, the completion of nuclear construction programs, and growth in cogeneration and power imports will limit

growth in the use of coal in the key utility market. As EXHIBIT 11 indicates, coal's share of electricity supply will decline slightly. Relatively little new coal fired capacity beyond what is already under construction will be needed by 2000. Utilities will minimize capital intensive generating projects by purchasing power, installing gas turbines or combined cycle units, or managing load more efficiently. Utility coal burn will rise by only ½ percent per year through 1990 as nuclear generation grows rapidly. Growth in coal use will accelerate to 2 per cent per year during the 1990s.

EXHIBIT 12 displays the outlook for coal demand by sector. Industrial steam coal consumption will rise a little more than 2 percent per year, lagging behind growth in industrial production. Clean coal combustion technologies will permit cost effective attainment of emission standards and give coal users greater flexibility in choosing supply sources. These technologies will help boost coal consumption, particularly when oil and gas prices rise during the 1990s. Metallurgical coal demand will decline, however, due to lower raw steel output and more electric arc furnace steel production.

U.S. coal exports will decline slightly from 1985-90. World coal demand will be constrained by lower oil prices, increasing nuclear capacity, and slow growth in steel production. In addition, coal production capacity outside the United States is expanding. During the 1990s, rising world coal demand will allow U.S. exports to increase. Steam coal exports will grow by 5 percent per year, while metallurgical coal exports gradually decline.

U.S. Nuclear Power

U.S. nuclear electricity generation will increase 9 percent per year from 1985-90 before declining gradually during the 1990s.

Completion of plants still under construction will lead to rapid growth in nuclear generation during the second half of the 1980s. However, high capital costs, long lead times, low oil prices, and environmental opposition will thwart further expansion of U.S. nuclear capacity. As existing plants age, capacity factors are likely to decline, leading to lower generation during the 1990s.

U.S. Oil Demand

U.S. oil demand will grow by more than 1 percent per year from 1985-2000, rising by over 3 MMBD. Consumption of all products will increase, with residual fuel oil experiencing the largest gain.

EXHIBIT 11

Shares of U.S. Electricity Supply

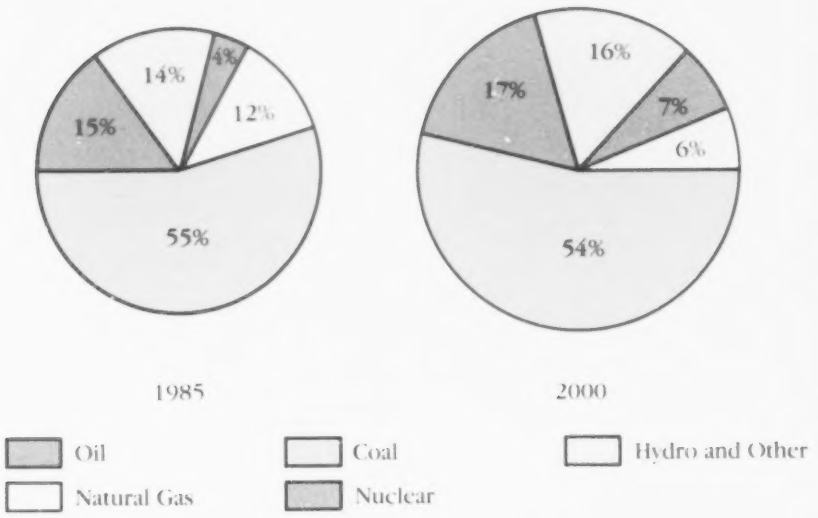


EXHIBIT 12

Demand for U.S. Coal

(Million Short Tons)

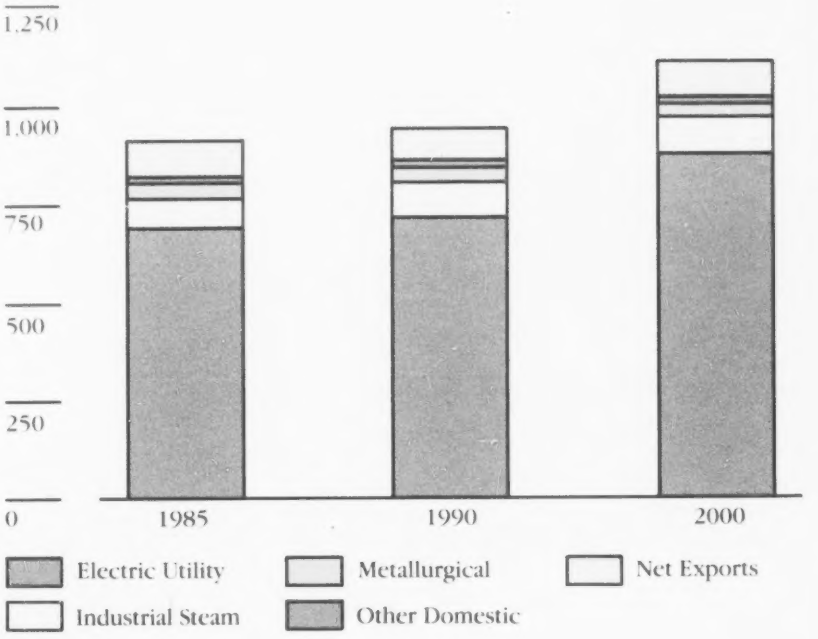


EXHIBIT 13

U.S. Oil Product Demand

(Million Barrels Per Day)

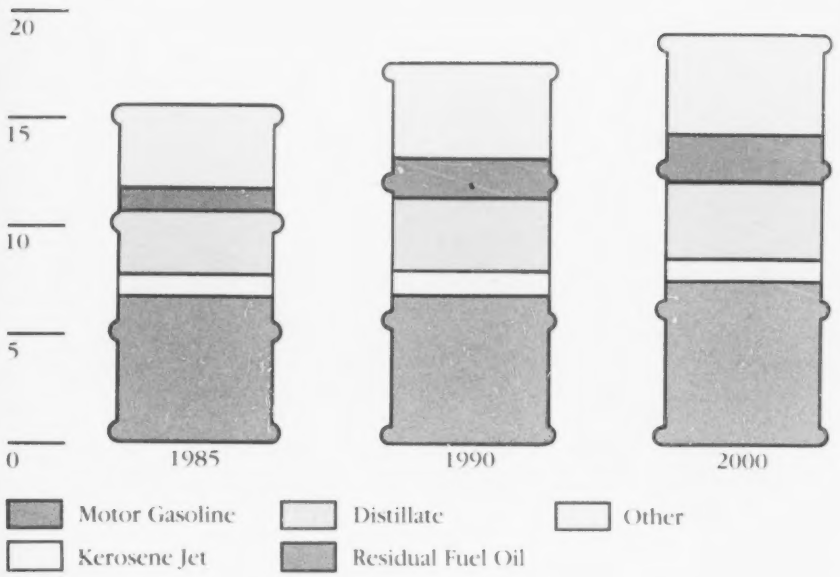
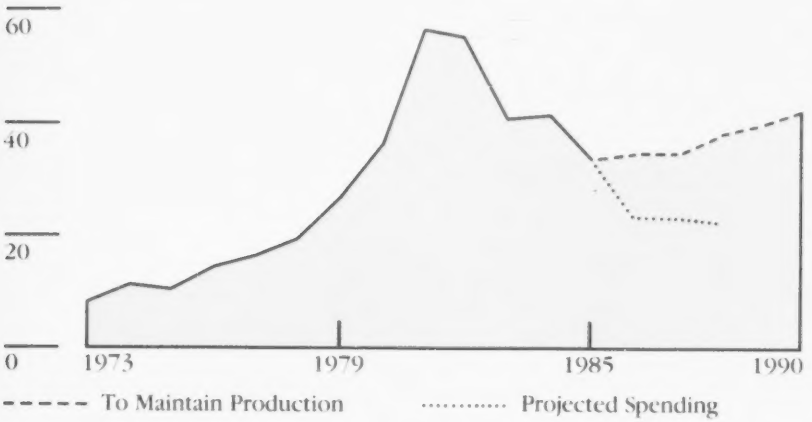


EXHIBIT 14

U.S. Petroleum Industry Upstream Capital Requirements

(Billion Dollars)



U.S. oil demand will increase from 15.7 MMBD in 1985 to 19.0 MMBD in 2000, as shown in EXHIBIT 13. Gasoline demand will rise as lower prices not only spur increased driving but also slow efficiency gains. Strong gains in the transportation sector, offsetting continued weakness in heating oil, will boost distillate fuel oil demand.

Lower oil prices will have the largest impact on residual fuel oil demand, which will nearly double. By 2000, fuel oil will win back from natural gas much of the dual fueled industrial and utility boiler market that it lost after the second oil price run-up.

Other products, including liquefied petroleum gases, petrochemical feedstocks and asphalt, will grow about 1 percent per year.

U.S. Oil Supply

U.S. crude oil production will fall by 2½ percent per year from 1985-2000, resulting in a decline of 3 MMBD. Natural gas liquids output will also fall. Net oil imports will rise from just over 4 MMBD in 1985 to nearly 11 MMBD in 2000.

The decline in U.S. exploration and development expenditures that has followed the collapse of oil prices will have a severe impact on domestic oil output. Reductions in lease acquisition and drilling costs will not be sufficient to restore incentives to drill. As a high cost production area, the United States will suffer the brunt of any cutback in capital budgets. In Alaska, new field development will not be sufficient to offset declines in the giant Prudhoe Bay Field that are likely to begin in the late 1980s. Lower 48 output will decline as drilling is insufficient to replace reserves. Furthermore, many thousands of high cost wells have already been shut down because of the price decline. Few new EOR projects are likely to be economic, and the synthetic fuels program has ground to a halt. Over the long term, significant contributions to domestic supply will require exploration of frontier areas and the development of new production technology. However, both activities will be scaled back as a result of the price collapse.

As oil demand rises, U.S. requirements will have to be met with higher imports. Crude oil and product imports will increase from 26 percent of demand in 1985 to 41 percent in 1990 and 56 percent in 2000. Furthermore, the bulk of the increase in imports is likely to come from regions vulnerable to supply disruptions. From the standpoint of energy security, this trend represents a significant backward step to the conditions of the early and mid-1970s.

Capital Requirements

U.S. investment in oil and gas exploration, development, and production will be well below the $200 billion needed to stabilize production through 1990.

The investment required to maintain U.S. oil and gas production has declined due to lower drilling and land costs. However, as a result of lower prices, the funds available for investment have fallen even faster. Sharply reduced expectations for the profitability of new projects also are depressing spending. EXHIBIT 14 indicates that approximately $200 billion would have to be invested in

U.S. oil and gas exploration and production (the "upstream" sector) through 1990 to keep output at 1985 levels. The dotted line on the graph shows anticipated investment through 1988, according to a recent survey. Given lower revenues, reduced price expectations, and increased capital demands from refining and transportation due to higher oil consumption, upstream spending will fall far short of recent levels. The large and widening gap between the two lines implies that U.S. oil and gas production will decline steadily.

Alternative Scenarios

As indicated earlier, uncertainty about the future course of oil prices complicates government policy formation as well as investor decision making. One way to deal with the uncertainty is to consider alternative futures that bracket the likely outcome.

Low- and high-price alternatives to the mid-range price path appear in EXHIBIT 1 on page 2. These alternatives are intended to provide reasonable lower and upper bounds, rather than to cover every possible price outcome.

Comparisons of the prospects for world reliance on OPEC and U.S. import dependence under the alternative price scenarios appear in EXHIBIT 15. These indicators were selected because they provide measures of energy security. However, they also indicate the considerable impact price changes eventually have on supply and demand.

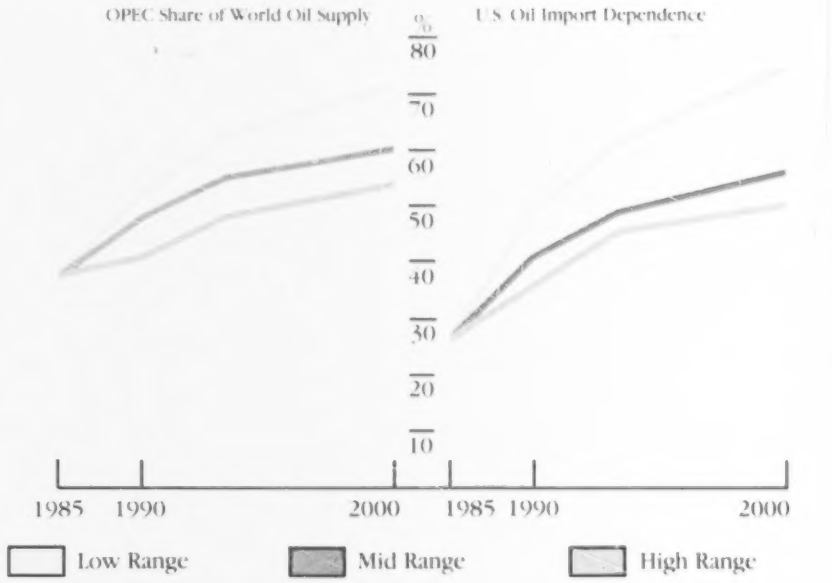
In the low-price scenario, prices fall to the $10-$12 per barrel range for several years as exporters fail to manage surplus capacity. Growth in oil demand and declines in non-OPEC supply accelerate, leading to greatly increased reliance on OPEC and upward price pressure. If OPEC either cannot or will not expand capacity to supply the huge volumes required by 2000, prices will have to increase much faster (as indicated by the arrow in EXHIBIT 1), leading to yet another destabilizing oil market cycle. If OPEC does expand capacity to meet demand at lower prices, it will control three-fourths of world oil supply by 2000, and U.S. oil imports will reach 15 MMBD.

In the high-price case, mutual recognition by OPEC members of the need for cooperation causes renewed production restraint, and prices quickly rebound above $20 per barrel. Following several years of increase with inflation, prices rise steadily in real terms through 2000. World and U.S. oil demands are lower as a result of the higher price level. Non-OPEC supplies are higher than in the mid-range case, but still decline from current levels. Required OPEC production expands to 27 MMBD, straining existing capacity. Even in the high-price case, world reliance on OPEC and U.S. reliance on oil imports both rise to over 50 percent of total supply.

Clearly, energy security will once again become a front-burner issue during the 1990s. Because of the long lead times typically required to bring new production onstream, steps aimed at preventing the next energy crisis must be taken now.

EXHIBIT 15

Comparison of Alternative Scenarios



Policy Implications

Although lower oil prices may be beneficial to the U.S. economy, increased reliance on oil imports by the United States will reduce the nation's energy security. Much of the actual vulnerability arises not from imports per se but because a large and growing portion of the world's oil supply is concentrated in a few countries where the risk of supply disruption is significant. This trend cannot be entirely avoided, but certain governmental actions can reduce U.S. energy vulnerability.

In the past, direct government intervention in energy markets has led to economic distortions and inhibited attainment of a secure domestic energy supply. Therefore, initiatives such as the imposition of import fees on crude oil and petroleum products should be avoided. In addition to reducing U.S. economic activity and impairing the ability of energy-intensive domestic industries to compete in world markets, a policy limited to U.S. energy self-sufficiency ignores the realities of our economic and political relations with allied countries that are also dependent on energy imports.

Clearly, the most direct method of improving the energy security of the United States and its allies is to develop surge capacity that can replace disrupted oil supplies. The U.S. Strategic Petroleum Reserve currently contains approximately 500 million barrels of crude oil. The targeted level of 750 million barrels should be achieved as quickly as is fiscally responsible. In addition, we should encourage our allies to develop similar petroleum inventory policies. In the event of a petroleum emergency, these supplies should be allocated by an auction system that relies on free market forces.

However, additional U.S. government policies are needed to remove impediments to the efficient functioning of energy markets. The nation's short- and long-term energy needs will be enhanced if the following policies are adopted:

Assure a tax environment that does not discourage development of domestic energy reserves.

The federal income tax system is undergoing a comprehensive overhaul. Proposed "tax reform" legislation would reduce the

incentive to invest in new plant and equipment, including the equipment necessary to develop domestic energy reserves. Furthermore, uncertainty about future taxation will not end with enactment of a bill. There remains the possibility that the energy industry will be targeted as a source of revenue to reduce the federal budget deficit. Moreover, many believe that petroleum refiners should bear a disproportionate share of the responsibility for supporting federal and state superfund programs. Adding to the industry's tax burden would be especially damaging given the current depressed state of energy markets. Investment in new reserves would be discouraged, and technological advances so vital to maintenance of a healthy domestic petroleum sector would be impaired.

Federal and state tax policies should avoid discouraging investment by the U.S. energy industry by following these guidelines:

- Avoid the enactment of new federal or state taxes on the energy industry. Additional revenue needs should be satisfied through broad-based taxes on consumption.
- Provide adequate cost recovery for tangible capital and intangible drilling and development costs. The distortion of investment incentives can be minimized through a system that allows the immediate expensing of all exploration, development, and production investment outlays.
- Reduce state and local severance and ad valorem taxes on oil and gas production.
- Repeal the Windfall Profit Tax (WPT). Now is a particularly good time for repeal, since the WPT currently collects no revenue, but still imposes a heavy accounting burden on the oil industry.

Remove existing restrictions on energy markets.

Historically, price controls and other government restrictions on the operation of energy markets have created hardships for consumers. When energy prices have not been allowed to attain market-clearing levels, overconsumption and reduced exploration activity have resulted. In a period of price weakness, continuing market restraints will accelerate the rise in U.S. dependence on foreign energy sources. The long-term interest of the industry and the public would be best served by removing the remaining government market restraints. The following specific actions would result in more balanced energy markets:

- Deregulate natural gas wellhead prices. The Federal Energy Regulatory Commission has adopted a rule that raises the price ceilings on some categories of "old" gas. This regulation may enable recovery of additional volumes of low-cost gas for consumers that would otherwise not be produced. However, comprehensive legislation that would eliminate price controls, provide open access to natural gas transportation, and remove natural gas demand restraints is needed.
- Lift the prohibition on the export of Alaskan crude oil. Restrictions on the export of oil from Alaska's North Slope depress the value of Alaskan crude at the wellhead, reducing exploration and development of Alaskan reserves. Although exporting Alaskan oil might increase U.S. imports in the short run, it could reduce worldwide dependence on uncertain supplies from the Middle East. Furthermore, to the extent that new Alaskan reserves are developed, more U.S. domestic supplies would be available in the event of an oil supply shortfall.

Enhance opportunities for development of U.S. mineral lands.

Policies that preclude the leasing of prospective oil and gas lands without regard to their petroleum potential are inappropriate, particularly considering the potential for future supply shortfalls. Large discoveries are most likely to occur in frontier areas where development is difficult and requires long lead times. Immediate acreage access is needed to ensure that these reserves are available in the future when oil supplies are not so abundant. The federal government already imposes leasing prohibitions on approximately 280 million acres onshore and tens of millions of acres offshore. Some of the acreage foreclosed to leasing has high potential. Access to such quality prospects can be preserved if the following policies are adopted:

- Exempt lands that have outstanding petroleum potential from leasing prohibitions. Reasonable access is needed to ensure the maximum contribution to our long-term energy security.
- Avoid unduly inhibiting the exploration stage of petroleum investments through new environmental planning mandates.
- Recognize the marginal economics of vital (but high-cost) OCS frontier and deepwater exploration by reducing the minimum bid levels for OCS tracts in these categories.
- Adjust lease terms to accommodate changing economic circumstances by reducing royalty rates, adopting profit-sharing alternatives to conventional royalties, extending lease terms, or through other measures that can help sustain important exploration and development in the face of short-term cash constraints.

Ensure that excessive environmental regulations do not needlessly inhibit industry activity.

Oil and gas production in the United States is governed by a set of state and federal regulations adopted to serve various safety and environmental policies. At lower oil prices, regulatory compliance costs can make development of some reserves uneconomic, heightening the probability that more cheaply produced foreign oil will supplant U.S. sources.

Federal and state agencies need to balance existing environmental and safety goals with the nation's energy security requirements. A carefully considered program of regulatory relief for the U.S. energy industry should include, among other actions, the following steps:

- Explicitly confine state authority under the Coastal Zone Management Act to OCS activities directly affecting state lands and waters. Attempts to extend state authority have led to extensive delays and subjugated national interests to parochial state concerns.
- Maintain existing discharge limitations for offshore oil exploration and production wastes, rather than requiring underground injection or other costly disposal methods. Current waste treatment practices adequately protect the offshore environment, and are at least as stringent as those followed by other producing nations.
- Provide relief from regulations requiring prompt, permanent plugging of wells shut down in response to petroleum price fluctuations. Once marginally productive wells are plugged, it is often uneconomic to restart them, meaning that valuable reserves may be permanently forfeited. Under current economic conditions, oil producers need the flexibility to be able to shut in wells for longer periods when lower prices dictate.

It is especially critical in the current market environment that short-sighted government policies do not add to uncertainty or nullify incentives to invest in domestic oil and gas supplies. By following the policy prescription discussed above, the United States can avoid inefficient development of its energy resources and minimize the risk of excessive dependence on foreign oil.

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Printed in U.S.A.